

CO Poisoning Surveillance

Defining the Problem

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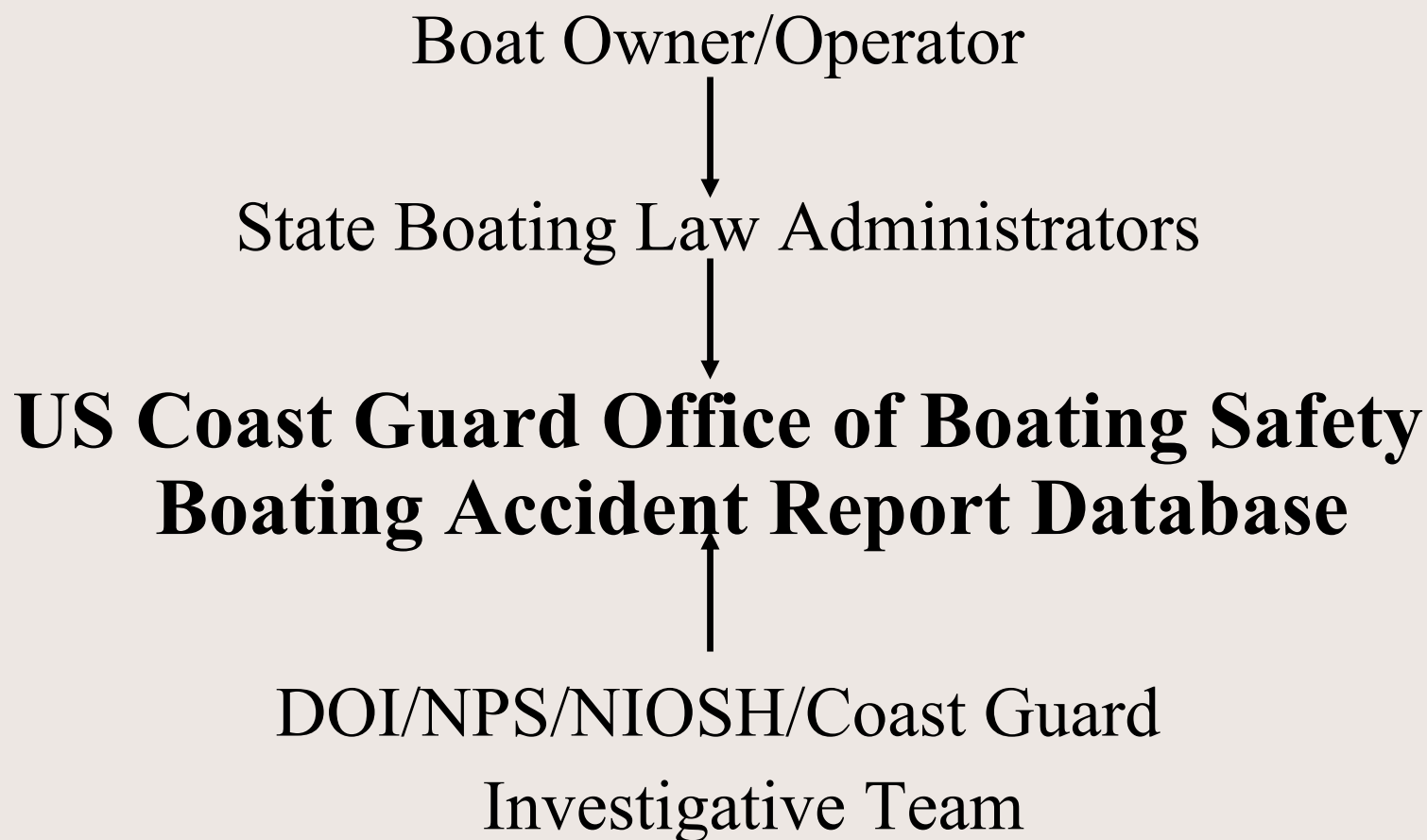
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Funded in part by US Coast Guard

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Who Collects Case Data Nationally?



Interagency Investigative Team

Began by collecting data at Lake Powell

**News coverage and individual presentations led
to random reporting of cases from various
sources**

**Consolidated those cases with Coast Guard data
for totals of known cases**

Lake Powell - 34% of all identified poisonings

More than 477 poisonings in 26 states, with 98% occurring between 1990 and 2002.

91 of the 477 people died and at least 77 others lost consciousness.

43 of 91 people died outside the cabin and 53 others lost consciousness.

State	Number of Poisonings
Alaska	7
Idaho	2
Montana	1
Wyoming	13
Nebraska	4
South Dakota	3
North Dakota	1
Minnesota	5
Wisconsin	1
Illinois	15
Indiana	2
Michigan	15
Ohio	5
Pennsylvania	8
Delaware	1
Maryland	4
District of Columbia	8
Virginia	1
North Carolina	4
South Carolina	8
Georgia	10
Florida	1
Alabama	1
Mississippi	1
Louisiana	1
Arkansas	1
Oklahoma	1
Kansas	1
Nebraska	4
South Dakota	3
North Dakota	1
Minnesota	5
Wisconsin	1
Illinois	15
Indiana	2
Michigan	15
Ohio	5
Pennsylvania	8
Delaware	1
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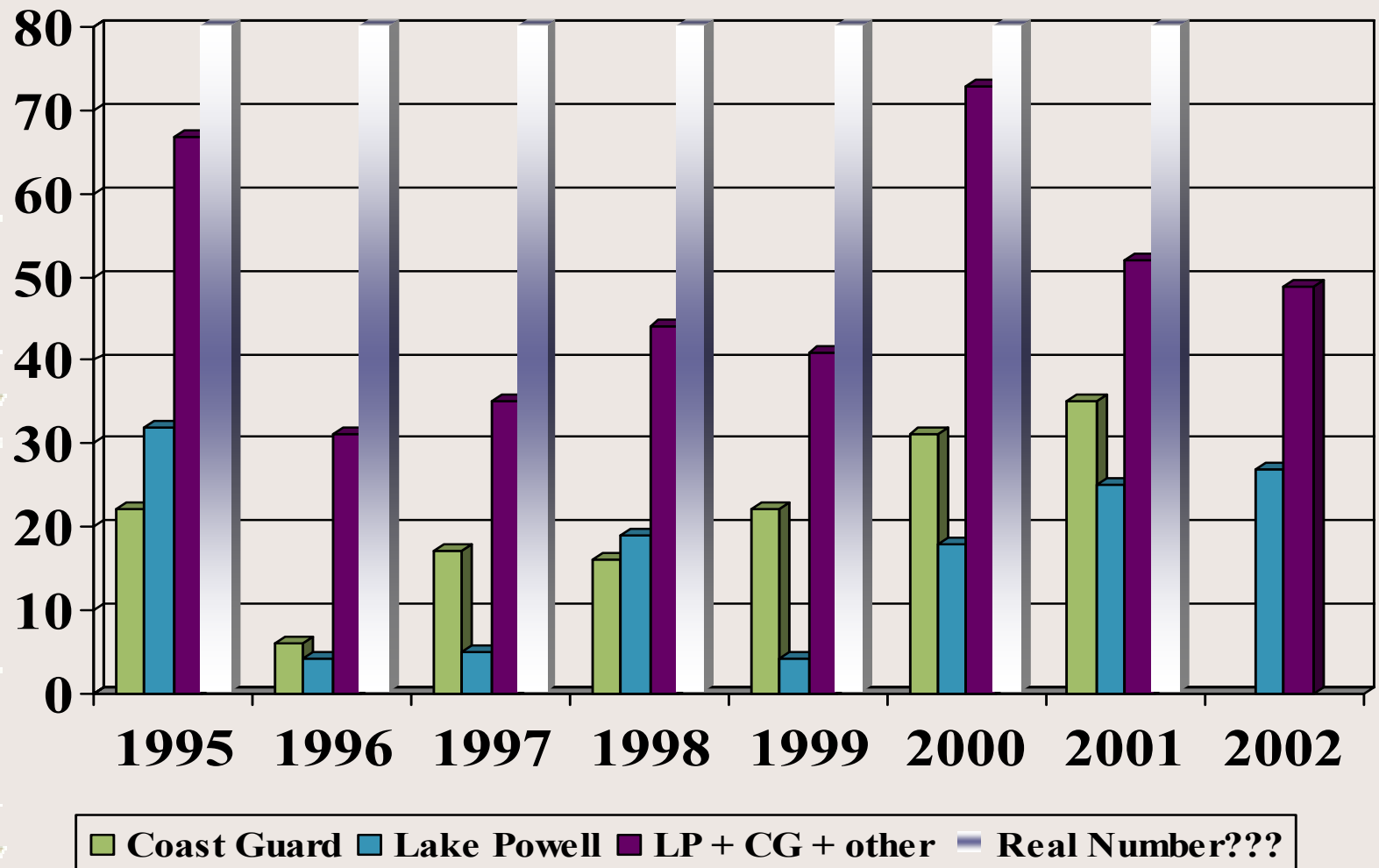
91 of the 477 people died and at least 77 others lost consciousness.

**43 of 91 people died outside the cabin
and 53 others lost consciousness.**

Why so many Lake Powell cases?

- **Initial recognition of the problem**
- **Documenting individual cases by NPS responders**
- **Systematic collection of statistics - 1990 to present**
- **Remember - Only severe poisonings requiring medical assistance were identified.**

How many poisonings?



Circumstances of Poisonings

145 (30%) occurred *outside* the cabin area with 43 (30%) of these resulting in death.

These deaths represent 47% of all identified boat related CO poisoning fatalities.

71/145 (49%) poisonings were outside of houseboats; 70 (48%) outside of pleasurecraft.

CO source: propulsion engines (43%) - generators (41%)

Circumstances of Poisonings

275 (57%) of the poisonings occurred *inside* an enclosed cabin area; 28 (10%) people died.

These deaths represent 31% of all the fatalities we know about.

We know the boat type for 23 of these deaths, 20 were on cabin cruisers, 2 on houseboats.

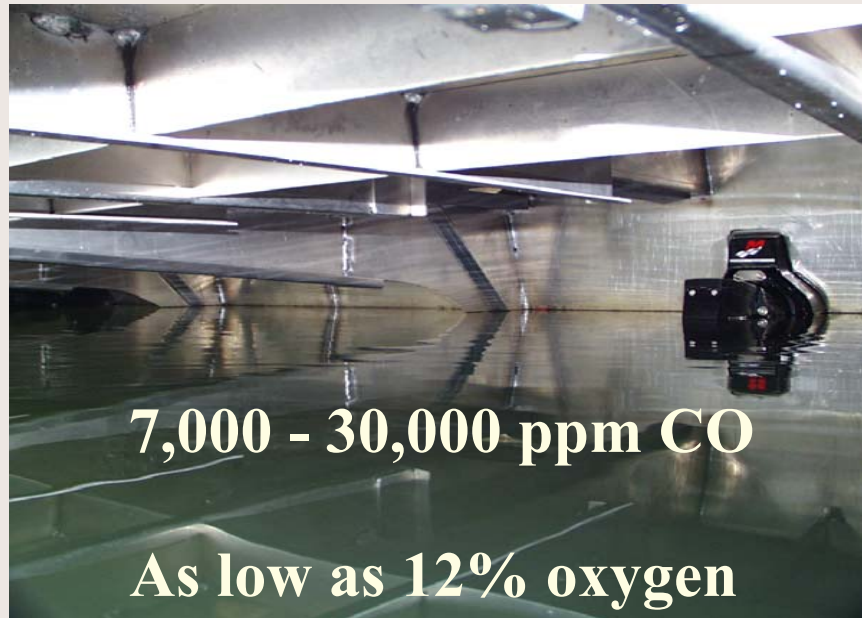
Less detail available on the source of CO.

Lake Powell Interagency Fatality

Investigation #1: Houseboat generators

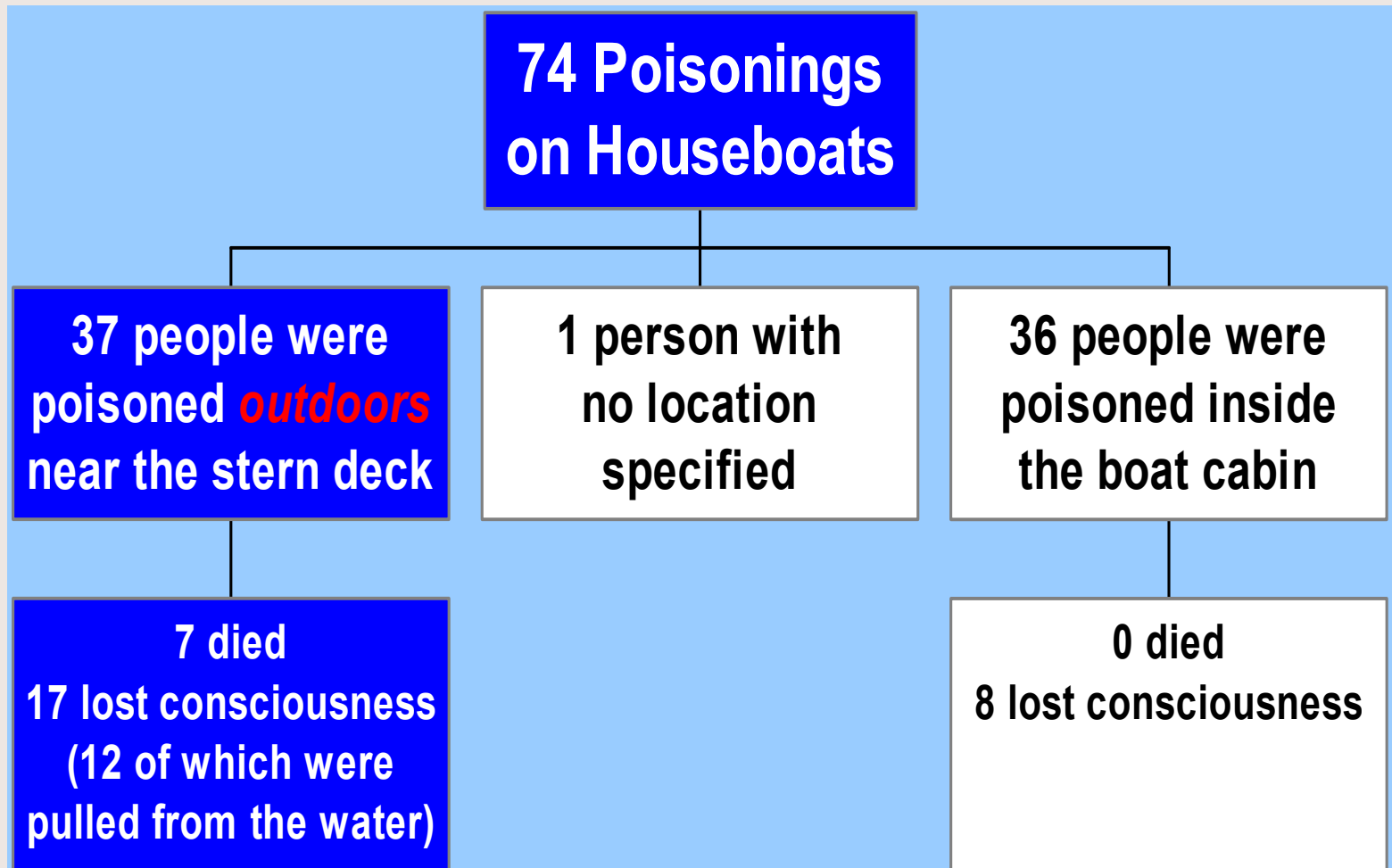


Lake Powell Fatality Investigations 2000



What we learned: Area under swim platform of a particular boat design is a confined space and must be treated as such. These boys were the 6th and 7th to die at Lake Powell on boats of this design. Overall, more than half of those poisoned in this space died.

CO Poisonings on Lake Powell: 111 cases 1990-2000



What we learned - Lake Powell:

64 people poisoned by generators

3 people poisoned by propulsion engines

7 people poisoned by both engines or an unspecified engine

CO also accumulates around swim platforms

Lake Powell Interagency Fatality Investigation #2: “Teak Surfing”



What we learned – Riding or sitting on the platform is common and deadly whether the boat is moving or sitting at idle.

Exhaust Accumulation





Platforms: Ski Boats and Cruisers

- **34 cases related to occupancy of the platform resulting in 15 deaths and 10 LOC**
- **29 of these were on ski boats, 2 on cabin cruisers, 3 unknown as to type of pl. craft**
- **9 while the boat was stationary – 24 while the boat was moving**
- **32 occurred since 1995 with 23 (68%) occurring since 2000**

Lake Powell Interagency Fatality Investigation #3: Cruiser Generator



- **What we learned:** We had possibly missed a huge target audience for educational materials – *the distributor*.

What we learned:

Very high CO concentrations outside of any enclosed space

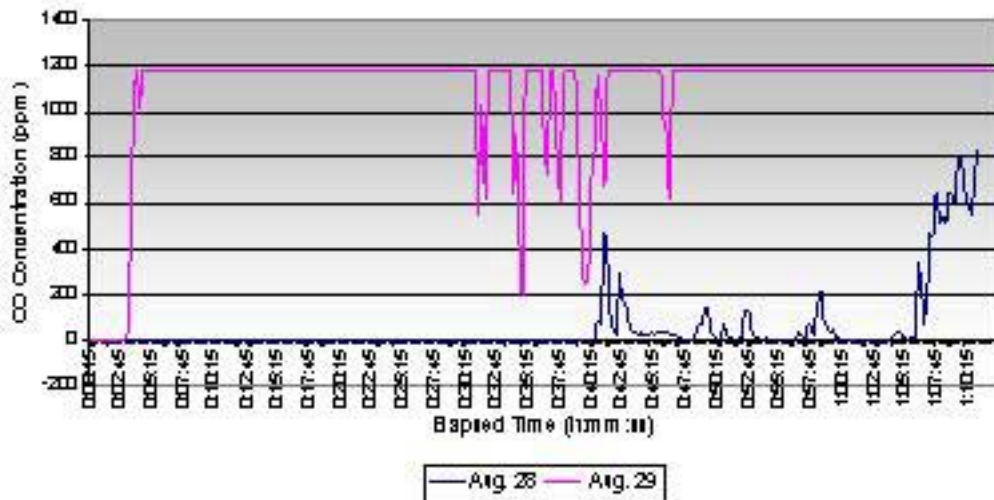


41,600 ppm at exhaust

567 at 10 feet

Comparison of CO concentrations at the starboard swim platform during generator operation on a windy day (August 28th) and a still day (August 29th)

Sea Ray 2001 260 DA Sundancer cabin cruiser
Kohler 5 kW generator
Lake Powell - August 28/29, 2002



Impact of wind outside of an enclosed space

Lake Powell Interagency Fatality Investigation

#4: Houseboat propulsion engine

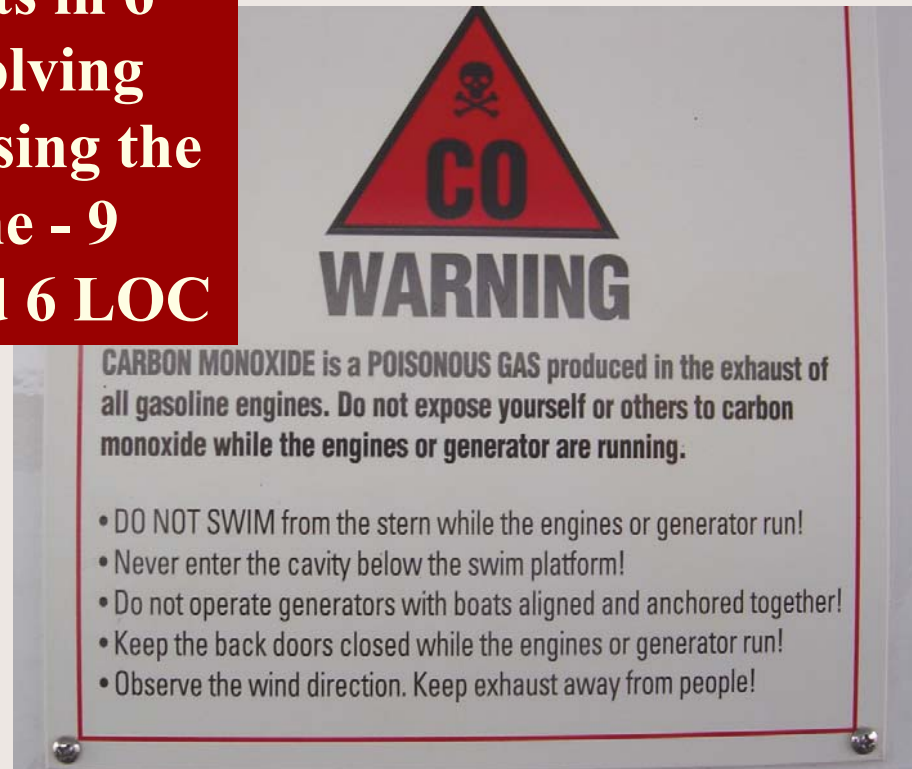


Warning label

What we learned: Awareness is not going to correct this problem, and the recall is only a part of the solution.

What we learned: Our recommendations have to match the facts.

17 incidents in 6 states involving adults accessing the HB engine - 9 fatalities and 6 LOC



**There are times when this space *must* be entered.
How can that be done safely?**

A universal problem

- **Not related to Lake Powell's macroenvironment (topography, gas supply, etc.);**
- **Is directly related to the microenvironment of individual exposure;**
- **Directly related to the design of the boats that puts people where the poison is.**

Lake Powell Fatality 2001: HB propulsion engine and generator



- **What we learned** - Public awareness alone will not correct this problem.

What's common to all these cases?

- **Humans with their 5 senses are unable to recognize this hazard. They ignore what they know because their senses are telling them there is no danger.**

Technology to Meet the Challenge

